Increases in the Use of Prescription Opioid Analgesics and the Lack of Improvement in Disability Metrics Among Users

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Abstract

Background and Objectives—In the United States, use of oral opioid analgesics has been associated with increasing rates of addiction, abuse, and diversion. However, little is known about recent national use of non-illicit prescription opioid analgesics (those prescribed in a doctor-patient relationship), the primary source of these drugs for the general US population. Our primary objective was to examine trends in the use of prescription opioid analgesics in the United States and to identify defining characteristics of patient users of prescribed opioids from 2000 to 2010.

Methods—We used the nationally representative Medical Expenditure Panel Survey to examine trends in prescription oral opioid analgesic use from 2000 to 2010. We used survey design methods to make national estimates of adults (18 years and older) who reported receiving an opioid analgesic prescription (referred to as opioid users) and used logistic regression to examine predictors of opioid analgesic use. Our primary outcome measures were national estimates of total users of prescription opioid analgesics and total number of prescriptions. Our secondary outcome was that of observing changes in the disability and health of the users.

Results—The estimated total number of opioid analgesic prescriptions in the United States increased by 104%, from 43.8 million in 2000 to 89.2 million in 2010. In 2000, an estimated 7.4% (95% CI, 6.9–7.9) of adult Americans were prescription opioid users compared with 11.8% (95% CI, 11.2–12.4) in 2010. Based on estimates adjusted for changes in the general population, each year was associated with a 6% increase in the likelihood of receiving an opioid prescription from 2000 to 2010. Despite the apparent increase in use, there were no demonstrable improvements in the age- or sex-adjusted disability and health status measures of opioid users.

Conclusions—The use of prescription opioid analgesics among adult Americans has increased in recent years, and this increase does not appear to be associated with improvements in disability and health status among users. On a public health level, these data suggest that there may be an opportunity to reduce the prescribing of opioid analgesics without worsening of population health metrics.

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INTRODUCTION

The United States (U.S.) Department of Health and Human Services has declared oral opioid analgesic diversion, addiction, and overdose an epidemic and the fastest-growing drug problem in the United States.[1,2] More recently, the Centers for Disease Control and Prevention (CDC) reported that total deaths in the United States from oral prescription opioids has exceeded deaths from cocaine and heroin combined.[3] For every death from a prescription opioid analgesic there are 10 treatment admissions for abuse and 32 emergency room visits for misuse.[4]

Available information regarding prescription oral opioid use is primarily limited either to voluntary data provided by the private sector or health and behavior surveys that seek specifically to describe illicit use. For instance, IMS Health, a company that tracks pharmaceutical sales data,[5] reports that hydrocodone/acetaminophen was the most prescribed medication of any category for at least the last 5 years.[6] Internationally, hydrocodone was prescribed 136.7 million times in 2011 and oral opioids overall 238 million times in 2011.[7] Despite being originally marketed and designed for chronic cancer pain, IMS Health also reports that the annual number of prescriptions for oxycodone hydrochloride controlled release (Oxycontin) for noncancer pain, an off-label use, increased tenfold, from about 670,000 in 1997 to about 6.2 million in 2002. Coinciding with this increase in Oxycontin, the Drug Abuse Warning Network (DAWN) reported that the misuse of Oxycontin alone rose from 221,000 persons in 1997 to 3,176,800 in 2004.[8]

Given that prescription opioid analgesics are the primary source of such drugs for the general U.S. population,[9] a better understanding of utilization patterns, as well as characteristics of prescription opioid analgesic users, would provide important information for both health care providers and policy makers as they confront the growing opioid-related health care crisis. Therefore, we used the nationally representative Medical Expenditure Panel Survey (MEPS) to examine recent trends in the use of prescription opioid analgesics from 2000 to 2010. More specifically, we sought to determine whether use of prescription opioid analgesics is changing over time and, if so, what characteristics may explain such changes. As potential increases in the use of prescription opioid analgesics may, in fact, improve health and functional status among Americans in need of these medications, we also examined disability and general health status of users over time.

METHODS

We used a serial cross-sectional study design to examine recent national trends in the use of prescription opioid analgesics. For all analyses, we used data from the MEPS, which is a nationally representative health survey conducted annually by the U.S. Agency for Healthcare Research and Quality and the National Center for Health Statistics. The MEPS is a well-known source of national data on U.S. health service use and expenditures and is comprised of both household and insurance components.[10,11] As this study used only de-identified and publically available data, it was deemed exempt from institutional board review by the Dartmouth College Committee for the Protection of Human Subjects.

Sample

The MEPS Household Component distributes questionnaires to individual household members to collect nationally representative data on sociodemographic characteristics, health conditions, health status, use of health care services, charges and payments, access to care, satisfaction with care, and health insurance coverage.[11,12] The MEPS uses the previous year's National Health Interview Survey as a sampling frame and uses an overlapping panel design involving 5 rounds of interviews over a 2½-year period. Telephone interviews and

record abstractions from health care providers, hospitals, and home health caregivers and from pharmacies provide further utilization and expenditure data.

We analyzed data from all study participants to the MEPS Household Component surveys from 2000 through 2010 who were 18 years and older. In 2010, there were 23,694 adult MEPS study participants, representing, when weighted, a national estimate of approximately 233.8 million adults.

Identification of prescription opioid analgesic use

We used the National Drug Code (NDC) classification system to identify the use of prescription opioid analgesics among adult MEPS study participants. The Drug Listing Act of 1972 requires registered drug establishments to provide the U.S. Food and Drug Administration (FDA) with a current list of all drugs manufactured. The NDC serves as a universal product identifier for drugs, with the FDA publically maintaining up to date information. All analyses were restricted specifically to oral prescription opioid analgesics. We operationally defined a prescription opioid analgesic as any oral prescription that had a NDC code that fit within the classification of "narcotic analgesic" or "narcotic analgesic combination;" the former category captured pure agonists like oxycodone and the later captured combination drugs such as oxycodone/acetaminophen (eg, Percocet). We identified 3,080 unique prescription types for opioid analgesics, each consisting of some varying aspect of manufacturer, dose, or formulary. A participant was classified as an "opioid user" if there was at least one reported prescription opioid analgesic during the last year. In addition, we also counted the number of prescriptions for each participant as an additional measure of opioid consumption.

Disability and health status

Because we anticipated the potential changes in the use of opioid analgesics might be associated with changes in functional status among users, we examined disability and health status measures according to oral opioid user status. We calculated the percentage of respondents who reported any limitations in: physical functioning, (eg, walking, climbing stairs, lifting, bending, standing); social functioning; cognitive functioning; work related to pain, and work, school, or home activities. We also calculated the percentage of respondents who reported any limitations at all during the entire year. Self-reported general health status was dichotomized into "good to excellent" vs " fair to poor." These responses to general health status were distinct from the 12-Item Short Form Health Survey that we also examined from 2000 to 2010 (both physical and mental components). We converted 2000–2002 version 1 scores to the version 2 equivalents, because version 2 was administered after 2002.[13]

Sociodemographic data

We analyzed data related to age, sex, race/ethnicity, education, and type of insurance coverage ("any private insurance," "public only coverage," or "uninsured"), total income, and U.S. Census region. Race/ethnicity were determined through respondent self-report using categories defined by the U.S. Census Bureau and were aggregated into "Hispanic," "non-Hispanic white," "non-Hispanic black," and "other/multiple." We compared sociodemographic characteristics of opioid users in 2000 versus 2010 to identify potential characteristics that might be associated with changes in opioid use over this time period.

Statistical Analyses

The MEPS uses stratified random probability sampling method that allows the generation of national estimates. All national estimates were generated by using established survey design

methods in Stata version 12.0 (StataCorp, College Station, Texas) that account for the probability of study inclusion and stratified sampling design.[10,11] To compare differences between opioid users and non-opioid users in 2010, as well as 2010 opioid users vs 2000 opioid users, we used a chi-squared test for categorical variables and an unpaired *t*-test for continuous measures. For all analyses we set the *P*-value for statistical significance to 0.05 (2-sided).

To determine whether the disability and health status of opioid users changed over the 11-year time period, we calculated estimates adjusted for age and sex using logistic regression models, and bootstrap resampling methods to obtain 95% confidence intervals (CI). We constructed a logistic regression model to examine associations between study participant characteristics and opioid use over time. The variable for year in this model was explored both as a continuous variable as well as indicator variables with 2000 as the reference category.

RESULTS

National Trends in the Use of Prescription Opioid Analgesics

According to our estimates, the total number of prescriptions of opioid analgesics increased by 104%; from 43.8 million in 2000 to 89.2 million in 2010, a net increase of 45.4 million prescriptions (95% CI, 38.8–52.0) (Figure 1).

The total number of adult Americans who received a prescription for an opioid analgesic rose approximately 80% from 15.3 million (95% CI, 14.2–16.4) in 2000 to 27.5 million (95% CI, 26.1–28.9) in 2010 (Table 1). As a percentage of all adult Americans, an estimated 7.4% adults (95% CI, 6.9–8.0) were opioid users in 2000 and 11.8% (95% CI, 11.2–12.4) in 2010. According to the rate of opioid analgesic prescriptions per 100 adults, we observed a persistent increase in those adults receiving 5 or more prescriptions per year (Figure 2). Among all opioid users, the mean number of opioid analgesic prescriptions per user did not statistically change over the 11-year time period: the mean number of prescriptions per user was 3.0 (95% CI, 2.9–3.1).

Predictors of Opioid Analgesic Use

After accounting for changes in population characteristics and health measures over the 11 years, each new year was associated with a statistically significant increase of 6% in the likelihood of being an opioid user (OR test of trend 1.06; 95% CI, 1.05–1.06) (Table 2). In a similar model, year 2010 versus 2000 was associated with a higher likelihood of being a prescription oral opioid user (OR 1.76; 95% CI, 1.58–1.95). Table 1 reveals additional independent predictors of being an opioid user. The characteristics of poor physical health, poor mental health, young, obese, uninsured, smoking, white, and female were all associated with higher likelihood of opioid use.

Disability and Health Status of Opioid Users Over Time

From 2000 to 2010, we found few changes in age and sex adjusted disability and general health status measures among opioid users (Table 2). Compared with 2000, opioid consumers in 2010 were more likely to report a poor mental health status (OR 1.39; 95% CI, 1.12–1.74). Additionally, opioid users in 2010 were more likely to report cognitive limitations compared to 2000 (OR 1.52; 95% CI, 1.12–2.07). The mean Physical Component Summary and Mental Component Summary scores for the SF-12 did not appreciably change. Additionally, there were no appreciable changes in self-reported physical health status, physical limitations; home, work, or school limitations; social limitations; physical activity, or any limitations.

Characteristics of Opioid Users

Compared with 2000, adult opioid users in 2010 were older, more likely to receive public health insurance, more likely to be unemployed, more likely to have higher education, more likely to be obese, and more likely to be in a low-income category (Table 3). In 2010, adult opioid users compared with non-users were older and had a higher proportion who were non-Hispanic white, female, covered by public insurance, unemployed, obese, current smokers, and in a lower income category (Table 3). Additionally, in 2010, adult opioid users compared to non-users, reported overall poorer mental health (4.0 lower Mental Component Summary scores; 95% CI −4.6, −3.4) and physical health (8.9 points lower Physical Component Summary scores; 95% CI, −9.6–8.1).

DISCUSSION

We found that the national use of prescription opioid analgesics increased from 2000 through 2010. Although the number of prescriptions per person has essentially remained unchanged, the proportion of Americans receiving at least one opioid analgesic prescription has risen steeply. Based on our adjusted estimates, each year was associated with a 6% increase in the likelihood of receiving an opioid prescription from 2000 to 2010. We suspect that the disproportionate drop in opioid prescribing in 2003 may have represented a sampling variation. However, it may also be explained by other factors such as drug company litigation, drug shortages, or the nadir effect of the 2000–2003 economic recession.

We were surprised to find that, despite an increase in prescription opioid analgesic use among U.S. adults from 2000 to 2010, disability and health status metrics either declined or remained essentially unchanged among users. Leading societal guidelines, advocacy groups, and regulatory statements have argued that more aggressive pain management (mostly through opioid analgesics) should lead to improvements in both physical and psychological health.[14–17] These purported health benefits of opioid analgesic use seem a logical prerequisite to justify the proven serious morbidity of prescription opioid analgesics stemming from epidemic levels of addiction, diversion, and overdose.[2,7,18,19] Our findings are consistent with other recent reports that appear to challenge the public health benefit of the expansion of opioid analgesic prescribing. For instance, a comprehensive review exploring the effectiveness of long-term therapy for chronic, noncancer pain highlights the paucity of compelling data on long-term opioid analgesic therapy.[20] In particular, there is limited evidence to support significant improvements in functional status and quality of life among opioid analgesic users.[21] In the outpatient setting, moreover, routinely measuring pain as a "fifth vital sign" in fact has not increased the quality of pain management.[22]

In our study, the effect of time on opioid analgesic use likely represents a combination of unmeasured cultural factors including aggressive pharmaceutical marketing and social/regulatory policy advocating for the liberal use of opioid analgesics. Worthy of note is the well-documented marketing campaign of Purdue Pharma L.P., makers of Oxycontin, one of the most popular opioids to date.[23] From a social policy perspective, the U.S. Veterans Health Administration adopted the "fifth vital sign" campaign in 2000 and enacted a national strategy to ensure that pain is routinely assessed at all patient encounters, using a 0-to-10 Numeric Rating Scale.[24] Finally, The Joint Commission on Accreditation of Health Care Organizations (JCAHO) released its 2001 mandate regarding pain management standards for health care organization accreditation.[17]

Our logistic regression model identified independent predictors of prescription opioid analgesic use. Such information may prove helpful in targeting educational initiatives around opioid analgesic safety or in constructing opioid-related research designs. The

sociodemographics of relatively young, obese, uninsured, smoking, non-Hispanic white, and female stood out as predictors even when controlling for mental and physical health status.

Limitations

There are several limitations to our study that must be acknowledged. First, MEPS data is only generalizable to non-institutionalized Americans; trends may differ among those in the military, for example. Second, MEPs data are observational and based on self-report, and, thus, are subject to potential unmeasured confounding. Our logistic model was based on a priori assumptions and univariate predictors but may have missed important unmeasured factors. Third, our data lack specificity regarding dose, quantity of drug, and duration of treatment. Therefore, it is possible that the absolute quantity of opioid analgesics has not changed within the population. Such a scenario is unlikely given prior information provided by the federal government.[9]

Lastly, as our study is a cross-sectional design, the lack of improvement in health and disability metrics should be interpreted with some caution. It is conceivable that disability and health metrics may have declined more in the absence of the expanded use of opioid analgesics. Future prospective observational studies are required to more rigorously evaluate the potential lack of association between expanding opioid analgesic use and disability metrics.

Conclusion

Our study suggests that the use of prescription opioid analgesics for adult Americans is on the rise. While the use of prescription opioid analgesics has increased, this increase does not appear to be associated with improvements in health status among opioid users commensurate with well-documented risks of these drugs. These data suggest that, on a public health level, there may be an opportunity to reduce opioid prescribing without worsening of clinical health metrics.

Acknowledgments

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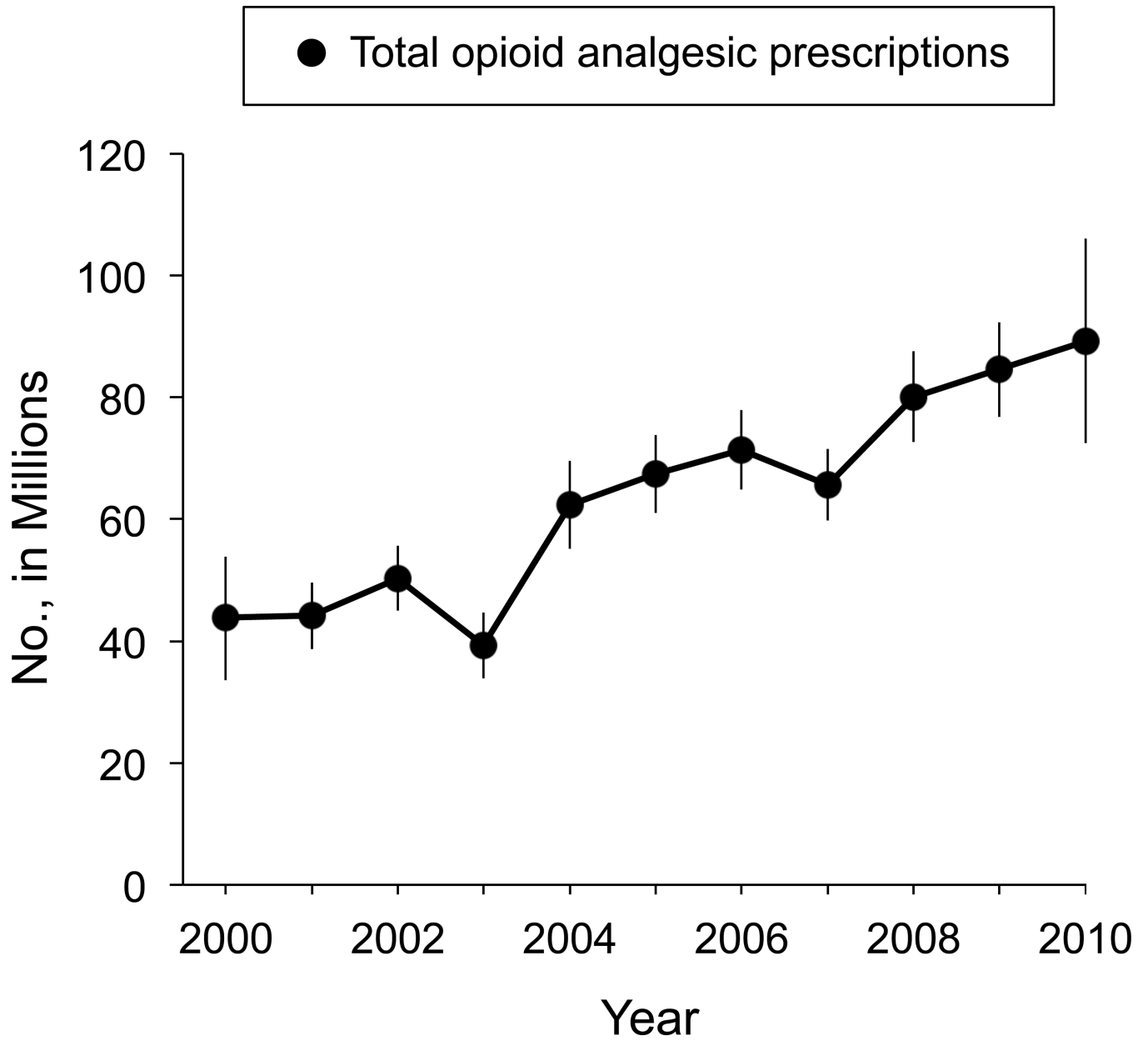
Figure 1.
Estimated total oral opioid prescriptions, 2000–2010. Line graph depicts point estimates with 95% confidence intervals.
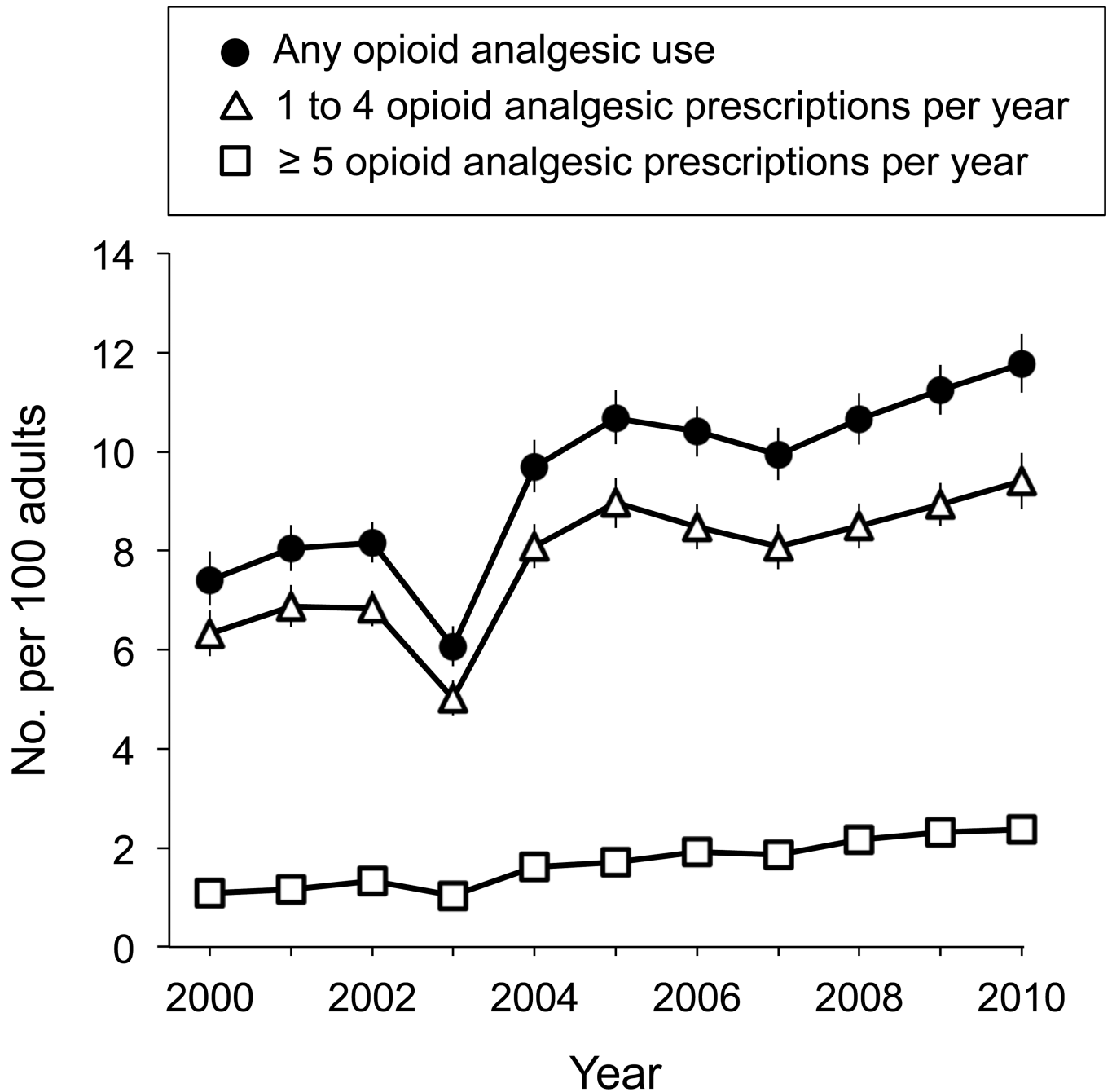
Figure 2.
Estimated total oral opioid users per 100 U.S. Adults. Line graphs depict varying
prescription quantities with point estimates and 95% confidence intervals.

Table 1

Respondent characteristics associated with oral opioid use, Medical Expenditure Panel Survey 2000 to 2010 [a] [b]

	% receiving opioids	Odds Ratio	95% CI	P-value
Year [c]	9.5	1.06	(1.05, 1.06)	<0.001
Age				
Young adult (18–30)	7.2	1.0 (reference)		
Adult (30–64)	9.8	0.87	(0.82, 0.92)	<0.001
Older adult (65+)	11.3	0.59	(0.55, 0.65)	<0.001
Sex				
Female	11.1	1.0 (reference)		
Male	7.7	0.75	(0.72, 0.79)	<0.001
Race/ethnicity				
White	10.4	1.0 (reference)		
Hispanic	6.2	0.64	(0.59, 0.68)	<0.001
Black	9.5	0.84	(0.79, 0.89)	<0.001
Other	6.4	0.62	(0.56, 0.68)	<0.001
PCS health score [d]				
First quartile, (<44)	20.2	1.0 (reference)		
Second quartile, (44–53)	9.1	0.42	(0.40, 0.44)	<0.001
Third quartile, (54–57)	5.8	0.28	(0.27, 0.29)	<0.001
Fourth quartile, (>57)	5.2	0.23	(0.21, 0.24)	<0.001
MCS health score [d]				
First quartile, (<45)	14.9	1.0 (reference)		
Second quartile, (45–53)	9.7	0.79	(0.76, 0.84)	<0.001
Third quartile, (54–58)	7.4	0.69	(0.65, 0.73)	<0.001
Fourth quartile, (>58)	8.0	0.56	(0.56, 0.64)	<0.001
Current Smoking				
No	8.9	1.0 (reference)		
Yes	13.1	1.39	(1.32, 1.45)	<0.001
Obesity				
No	8.4	1.0 (reference)		
Yes	12.7	1.20	(1.15, 1.25)	<0.001
Marital Status				
Married	9.4	1.0 (reference)		
Previously married	12.6	1.07	(1.02, 1.13)	<0.001
Never married	7.2	0.91	(0.87, 0.97)	0.002
Insurance				
Any private	9.5	1.0 (reference)		
Public only	13.3	1.00	(0.95, 1.06)	0.001
Uninsured	5.3	0.53	(0.49, 0.56)	<0.001
Census Region				

	% receiving opioids	Odds Ratio	95% CI	P-value
Northeast	8.2	1.0 (reference)		
Midwest	10.5	1.23	(1.14, 1.33)	<0.001
South	10.1	1.20	(1.12, 1.29)	<0.001
West	8.9	1.20	(1.12, 1.29)	<0.001

Abbreviations: CI, confidence interval; BMI, body mass index; PCS, physical composite summary; MCS, mental composite summary

[a] All estimates based on weighted sample using survey design methods for adults 18 and older.

[b] Odds ratios were generated from the multivariable logistic regression model predicting opioid use. All covariates are represented except education and income that were not statistically significant.

[c] All years (2000–2010) included for analysis. Odds ratio for year represents the test of trend across 11 years.

[d] PCS and MCS scores range from 0–100, with a higher score indicating better functioning

Table 2

Self-reported health status and disability measures for adult opioid users, age and sex adjusted, MEPS 2000–2010[a,b]

Measure	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Estimated No. of adult opioid users, millions	15.3	16.9	17.7	13.3	21.2	23.8	23.4	22.5	24.6	25.9	27.4
Summary score, mean[c]											
PCS	43.5(38.8, 48.2)	43.5(39.9, 47.1)	43.9(40.5, 47.4)	41.9(37.5, 46.4)	43.5(40.1, 46.8)	42.3(38.6, 45.9)	42.8(39.4, 46.2)	42.3(38.3, 46.2)	41.8(37.9, 45.8)	42.1(38.5, 45.7)	41.7(37.3, 45.7)
MCS	48.5(43.7, 53.2)	48.4(44.6, 52.2)	48.2(44.3, 52.1)	47.9(42.8, 52.9)	47.6(43.8, 51.4)	48.0(44.4, 51.7)	48.3(44.7, 51.9)	48.1(44.3, 51.9)	47.8(44.2, 51.6)	47.8(43.9, 51.7)	47.6(52.3, 42.9)
Any limitation in physical function, % yes	29.2(29.0, 29.5)	29.1(28.9, 29.3)	29.1(28.8, 29.3)	28.9(28.7, 29.2)	28.9(28.7, 29.0)	28.8(28.7, 29.0)	28.7(28.4, 29.0)	28.6(28.4, 28.8)	28.5(28.3, 28.8)	28.4(28.2, 28.6)	28.4(28.1, 28.6)
Any work, home, or school limitation, % yes	24.1 (23.9, 24.3)	23.9(23.8, 24.2)	23.8(23.6, 23.9)	23.6(23.4, 23.8)	23.4(23.3, 23.6)	23.2(23.1, 23.4)	23.1(22.9, 23.3)	22.9(22.8, 23.0)	22.7(22.6, 22.8)	22.5(22.4, 22.7)	22.4(22.2, 22.5)
Excellent to good health status, % yes	71.8(71.7, 71.9)	71.8 (71.7, 71.9)	71.9(71.7, 72.0)	71.9(71.7, 72.0)	71.9(71.7, 72.0)	71.9(71.8, 72.0)	71.9(71.7, 72.0)	71.9(71.8, 72.0)	71.9(71.7, 72.0)	71.9(71.8, 72.0)	71.9 (71.8, 72.0)
Excellent to good mental health status, % yes	87.3(87.2, 87.3)	86.9(86.9, 87.0)	86.7(86.7, 86.8)	86.5(86.4, 86.5)	86.2(86.1, 86.2)	85.9(85.9, 86.0)	85.7(85.6, 85.7)	85.4(85.3, 85.4)	85.1(85.0, 85.1)	84.8(84.8, 84.8)	84.5(84.4, 84.5)
Any cognitive limitation, % yes	8.5(8.4, 8.5)	8.7(8.6, 8.67)	8.8(8.9, 9.0)	9.0(8.9, 9.1)	9.2(9.1, 9.2)	9.3(9.3, 9.4)	9.5(9.4, 9.6)	9.6(9.6, 9.8)	9.9(9.8, 9.9)	10.1(10.0, 10.3)	10.2(10.2, 10.3)
Any social limitation, % yes	14.6(14.6, 14.7)	14.5(14.4, 14.5)	14.4(14.3, 14.5)	14.3(14.4, 14.4)	14.2(14.1, 14.3)	14.0(13.9, 14.1)	13.9(13.8, 14.0)	13.8(13.7, 13.9)	13.7(13.6, 13.8)	13.6(13.5, 13.7)	13.5(13.4, 13.6)
Any limitation during year, % yes	49.1(48.8, 49.3)	48.9(48.7, 49.2)	48.8(48.6, 49.1)	48.7(48.6, 48.9)	48.6(48.4, 48.8)	48.5(48.2, 48.7)	48.4(48.1, 48.6)	48.2(47.9, 48.5)	48.1 (47.9, 48.4)	47.9(47.7, 48.1)	47.9(47.6, 48.1)
Any limitation in work from pain, % yes	69.4(69.2, 69.6)	69.6(69.5, 69.8)	69.8(69.6, 70.0)	70.0(69.9, 70.2)	70.3(70.1, 70.4)	70.5(70.3, 70.6)	70.7(70.6, 70.8)	70.9(70.7, 71.1)	71.1(71.0, 71.2)	71.3(71.1, 71.5)	71.5(71.3, 71.7)
Moderate to vigorous physical activity, % yes[d]	47.7(47.6, 47.8)	48.0(47.9, 48.1)	48.3(48.2, 48.4)	48.6(48.5, 48.7)	48.9(48.7, 49.0)	49.2 (49.0, 49.3)	49.4(49.3, 49.8)	49.7 (49.6, 49.8)	50.0(49.9, 50.1)	50.3(50.2, 50.4)	50.6(50.5, 50.7)

Abbreviations: MEPS, Medical Expenditure Panel Survey; CI, confidence interval; MCS, Mental Composite Summary; PCS, Physical Composite Summary; adult, 18 and older.

[a] All estimates based on weighted sample using survey design methods.

[b] Values expressed as either count, mean (95% CI) or proportion answering "yes" (95% CI)

[c] PCS and MCS scores range from 0–100, with a higher score indicating better functioning.

[d] Frequency defined as three times per week

Table 3

Characteristics of US adult population by opioid status, Medical Expenditure Panel Survey 2000 and 2010

Variable	2000 [a]		2010 [a]		P-value for difference between groups [b]	
	Opioid user	Non-opioid user	Opioid user	Non-opioid user	Opioid users and non-users, 2010	Opioid users, 2000 vs. 2010
No. sampled (respondents)	1,277	16,481	2,542	21,152		
Estimated No. adults in US population, millions	15.3	190.7	27.5	206.3		
Age	46.4 (45.0, 47.7)	44.9 (44.5, 45.5)	50.1 (49.0, 51.2)	45.9 (45.5, 46.4)	<0.001	<0.001
Men, %	39.8 (36.7, 43.1)	48.5 (47.9, 49.2)	40.2 (38.2, 42.3)	49.6 (48.9, 50.2)	<0.001	0.19
Employment [c], %	50.3 (46.7, 53.9)	61.2 (59.9, 62.5)	44.3 (41.5, 47.2)	57.3 (56.6, 58.6)	<0.001	0.01
Race /ethnicity, %					<0.001	0.01
hispanic	6.7 (4.9, 9)	11.0 (9.3, 13.0)	10.3 (8.6, 12.2)	14.6 (13.1, 16.3)		
white	80.2 (77.8, 82.5)	73.4 (71.2, 75.6)	73.6 (71.5, 75.5)	66.9 (64.8, 68.9)		
black	10.0 (8.1, 12.3)	11.6 (9.8, 13.7)	12.1 (10.6, 13.7)	11.5 (10.3, 12.7)		
other	3.1 (2.1, 4.7)	4.0 (3.4, 4.8)	4.1 (3.4, 5.1)	7.1 (6.0, 8.3)		
College or advanced degree [d], %	24.9 (22.4, 27.5)	29.9 (28.4, 31.5)	31.9 (29.0, 34.9)	37.3 (36.2, 38.5)	<0.001	<0.001
Marriage, %					<0.001	0.02
current married	58.6 (54.8, 62.3)	55.5 (54.1, 56.9)	52.1 (49.8, 54.4)	53.2 (51.7, 54.6)		
never married	16.9 (14.1, 20.3)	25.0 (23.9, 26.2)	19.5 (17.7, 21.5)	28.2 (27.2, 29.3)		
previously married	24.4 (21.7, 27.3)	19.5 (18.6, 20.4)	28.4 (26.2, 30.1)	18.6 (17.7, 19.5)		
Low income, %	39.1 (36.2, 42.1)	32.9 (31.8, 34.2)	35.3 (33.0, 37.7)	30.2 (29.2, 31.1)	<0.001	0.05
Insurance, %					<0.001	<0.001
private	74.8 (71.6, 77.7)	73.8 (72.3, 75.2)	62.1 (59.6, 64.5)	67.9 (66.6, 69.1)		
public	17.9 (15.3, 20.8)	13.3 (12.3, 14.4)	28.1 (25.7, 30.1)	16.0 (15.2, 16.9)		
uninsured	7.3 (12.1, 13.9)	12.9 (5.8, 9.2)	9.8 (8.7, 11.1)	16.1 (15.1, 17.1)		
Census region, %					0.003	0.51
Northeast	15.0 (10.6, 20.8)	19.4 (16.2, 23.1)	17.7 (14.0, 22.2)	18.6 (16.2, 21.2)		
Midwest	24.7 (19.4, 30.8)	22.9 (18.9, 27.3)	24.9 (20.4, 29.6)	21.3 (17.9, 25.2)		
South	36.2 (29.5, 43.5)	35.4 (29.7, 41.6)	38.3 (34.2, 42.5)	36.5 (33.3, 39.7)		
West	24.1 (17.0, 32.9)	22.3 (17.5, 27.9)	19.4 (16.1, 23.0)	23.7 (20.6, 27.0)		
Obesity [e], %	27.8 (27.4, 28.3)	26.8 (26.6, 26.9)	29.2 (28.8, 29.5)	27.6 (27.4, 27.7)	<0.001	<0.001

Variable	2000 [a]		2010 [a]		P-value for difference between groups [b]	
	Opioid user	Non-opioid user	Opioid user	Non-opioid user	Opioid users and non-users, 2010	Opioid users, 2000 vs. 2010
Current smoker, %	31.4 (27.9, 35.1)	22.4 (21.5, 23.4)	27.7 (25.5, 30.0)	16.6 (15.7, 17.6)	<0.001	0.08
Summary health score[f], mean						
PCS	43.5 (42.7, 44.4)	50.8 (50.5, 51.0)	41.6 (40.9, 42.4))	50.5 (50.3, 50.7)	<0.001	0.001
MCS	48.4 (47.6, 49.3)	51.2 (50.9, 51.4)	47.6 (47.0, 48.2)	51.6 (51.4, 51.8)	<0.001	0.11

Abbreviations: Abbreviations: CI, confidence interval; BMI, body mass index; PCS, physical composite summary; MCS, mental composite summary

[a]Values express as either proportion answering "yes" or mean (95% CI)

[b]Categorical data compared using chi-square, continuous data compared using two-sample t-test

[c]Employment for the entire year

[d]Education dichotomized into "College or advanced degree" vs. "High school or less"

[e]Obesity defined as a BMI of 30 or greater

[f]PCS and MCS scores range from 0–100, with a higher score indicating better functioning